The Role of Disorder in Producing Supersolid Phases(New Development of Numerical Simulations in Low-Dimensional Quantum Systems: From Density Matrix Renormalization Group to Tensor Network Formulations)

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Recent experimental evidence [1] supports a picture where the glass state can play an important role in creating superflow, and some simulation results [2] find the existence of a novel "superglass" state. Furthermore, there are also findings that a *lack* of disorder and frustration cause the supersolid phase to become unstable [3, 4]. In order to better understand the relationship between disorder, frustration, and the superglass state, we consider a disordered Bose-Hubbard model and tune parameters controlling the level of disorder. We solve the model through quantum Monte Carlo simulations using the worm algorithm. A first study involves scanning the bimodal distribution probability $p(V_ij = +V)$ to see the transition from the ordered states p 0, 1 to the glassy intermediate states. Initial results suggest paired onset of superflow and glassy behavior for the parameters under consideration.

References

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